MISSISSIPPI SPR-1(38), PART II

GENERAL COMMENTS ON RESEARCH WORK PROGRAM FOR FISCAL YEAR 2002

The expected SPR research work program allocation for FY 2002 totals $1,632,728 and includes a National Cooperative Highway Research Program (NCHRP) contribution of $359,200 for FY 2002, and pooled-fund studies totaling $194,149 for FY 2002 as detailed in the program tabulation and narrative included in this document. The NCHRP funding is 5.5% of the total SPR allocation (Parts I and II). This work program tabulation also includes renewal statements for all on-going line items. The renewal statements for state studies contain financial information including total study budget, total expenditures to date, and cost estimates for fiscal year 2002. Also included in the renewal statements for state studies are narrative descriptions of study objectives, accomplishments of the past year, and work planned for fiscal year 2002. Beginning and completion dates are shown for each state study. Line items other than state studies have narrative descriptions of scope, objectives and anticipated activities along with a cost estimate. These tabulations and renewal statements constitute the FY 2002 research work program.

The pooled fund studies, Mississippi's second round of peer exchange and NCHRP are funded with 100% SPR Part II funds (no state match). The twenty-seven line items in the tabulation mentioned above includes only those items for which there is a state match in the funding.

State study numbers in this work program are the same as those currently being used, and they will remain the same in all correspondence. Study proposals for future submissions will be numbered sequentially.

The SPR allocation for FY 2001 was $1,632,728. To be on the conservative side, an allocation in the same amount as last year is being used for FY 2002. This would amount to $1,632,728 and the state match would be $269,845.

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PART II

LINE ITEM 1

Research Administration

This line item covers those direct costs chargeable for administration which, due to their nature, are difficult to apportion to the separate studies. Chargeable categories include preparation of contracts and proposals, collection of background information on individual studies, acquisition of basic reference materials and bibliographies, determining the qualifications of institutions and other groups for performing studies, providing for report review, and miscellaneous implementation of research products not specially accounted for elsewhere. Routine surveillance and support of contracted research studies, where not provided for elsewhere, are also included in this item. Overhead items such as housekeeping, accounting, and office rental will be included in these charges.

Cost Estimate for FY 2002

Salaries (Regular Employees)	$171,632
Employee Benefits	$48,368
Materials, Supplies, and Services	15,000
Travel and Sustenance	10,000
Total	$245,000

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PART II

LINE ITEM 2

Transportation Research Board Correlation Service

This line item provides for subscription to a “Research Correlation Service” from the Transportation Research Board, a service established and operated in accordance with the recommendation of the Executive Committee of AASHTO. The activities supported by this subscription include the collection of available information concerning past, current and proposed research related to transportation from all sources including federal, state and other government agencies, colleges and universities, research and planning organizations, transport operators and industry, as well as the TRB Annual Meeting and conference programs; the study and correlation of this information through the work of the committees of the Board and dissemination of the useful findings of research and other information by all feasible means including the several TRB publication series, the output of the Transportation Information Services, and through personal contacts during scheduled field visits by the TRB professional staff. The FY 2002 TRB Correlation Service line item is funded for $84,625, which corresponds to the current annual subscription cost for Mississippi.

Cost Estimate for FY 2002 $84,625

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PART II

LINE ITEM 3

Long-Term Pavement Performance

This line item is for support of the Long-Term Pavement Performance (LTPP) program begun under the Strategic Highway Research Program (SHRP) and now a part of the Federal Highway Administration (FHWA). Activities covered include site nomination, site verification, historic data searches, support for material sampling and field-testing, construction supervision, and technology transfer activities associated with LTPP and SHRP product implementation.

Activities conducted in FY 2001 included:

- implementation of LTPP products
- marking and signing of LTPP sites
- support for field data collection

Activities planned for FY 2002 include:

- maintaining signage for existing LTPP sites
- support for all LTPP activities

Cost Estimate for FY 2002

Salaries (Regular Employees)	$11,826
Employee Benefit	3,311
Materials, Supplies, and Services	4,363
Travel and Sustenance	500
Total	$20,000

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PART II

LINE ITEM 4

Implementation of Research Projects

This line item funds Research Division activities relating to implementation of research studies.

Implementation Activities consist of field and office activities that apply research results to the solution of operational problems in the transportation area. Examples of these activities are:

1. Applying new products and/or procedures in the field to specific field problems.
2. Short-term field and/or office technical support in trouble-shooting and design.
3. Assistance in development of specifications and tests to implement new products or procedures.
4. Identifying areas in which research is required.
5. Initial preparation costs associated with proposed research.

Research information for implementation may originate from MDOT's Research Program (in-house and Contract), including both completed and ongoing studies; from other state transportation agencies' experiences and research; from national and international sources, from the FHWA; and from major research sources such as NCHRP, Corps of Engineers, etc.

Cost Estimate for FY 2002

Salaries (Regular Employees)	$172,000
Employee Benefits	48,160
Materials, Supplies, and Services	9,840
Travel and Sustenance	10,000
Total	$240,000

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PART II

LINE ITEM 5

Technology Transfer

This activity funds Research Division activities relating to the distribution of information about transportation technologies to any of MDOT Research Division's transportation customers. These are not new activities but have been on going for many years. This line item is included to facilitate better documentation of technology transfer activities.

There are many similarities between items falling under the categories ***Technology Transfer*** and ***Implementation*** of this work program. For the purposes of this work program, a distinction will be made that ***Implementation*** will be concerned with actively putting research results into practice while ***Technology Transfer*** will refer to efforts to disseminate information. One noteworthy example of work in this area is technology exchange relating to implementing of Superpave. Other examples of technology transfer are:

- making presentations of research results to various groups such as universities and technical societies
- participation in seminars and training courses
- distribution of research results
- inputting research and research-in-progress results into the Transportation Research Information Service (TRIS)

The SPR WORK PROGRAM-PART I, Technology Transfer, provides direct support to the Center for Technology Transfer (T^2) at Jackson State University, and those activities and funds are not included in the above line item, Technology Transfer.

Cost Estimate for FY 2002

Salaries (Regular Employees)	$12,000
Employee Benefits	3,360
Materials, Supplies, and Services	640
Travel and Sustenance	4,000
Total	$20,000

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PART II

LINE ITEM 6

Pavement Management

This item covers the activities of the Research Division relating to the development, implementation, and operation of the Department's Pavement Management System.

Activities include awareness of national pavement management state-of-the-art and practice, administration of field data collection and statewide database development, administration of pavement condition survey contracts, quality assurance for condition surveys, in-house software development, administration of contract software development, planning and conducting in-house training, administration of contract pavement management research, and implementation of pavement management research.

Cost Estimate for FY 2002

Salaries (Regular Employees)	$178,125
Employee Benefits	49,875
Materials, Supplies, and Services	2,000
Travel and Subsistence	10,000
Total	$240,000

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PART II

LINE ITEM NO. 7	STATE STUDY NO. 132
TOTAL STUDY BUDGET: $70,000	TOTAL STUDY COST TO DATE: $4,909
DATE STARTED: 01/01/99	COMPLETION DATE: 09/30/03
STUDY TITLE:	Performance and Evaluation of Median Barrier Curbs and Traffic History Devices at Highway Railroad Grade Crossings in Mississippi
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATORS:	John W. Avent and Randy L. Battey

Objective:
The objective of this study is to determine if median barrier curbs with delineator panels will reduce the risk of collisions at highway-rail grade crossing both in urban and rural areas, and if so, to determine the optimal length of an effective installation. A second objective is to determine if the installation of video cameras along with signs so stating that these devices are monitoring the grade crossings will also reduce the drive-arounds.

Five different tasks will be undertaken to satisfy the objectives:
- Selection of Highway-Rail Crossings.
- Procurement of Equipment.
- Installation of Equipment.
- Data Collection.
- Reporting and Implementation Plan.

This study is being conducted jointly by the Research Division, Rails Division, and Traffic Engineering Division.

Progress:
The cameras and mounting equipment has been procured and two of the sites have had cameras installed for testing purposes. Agreements with each local government are in place. Attempts have been made to obtain agreements with the railroads to tie into their system. This is critical since the cameras need to only be activated when a train is in the vicinity of the crossing. This would minimize the amount of film that would be generated. Currently the necessary agreements have stalled within the legal divisions of the department and the railroads.

Plans for FY 2002:
Obtain an agreement with the railroads to tie into their system. Install the cameras and curbs at all sites. This study will monitor the traffic for a period that is long enough to determine that the devices are working and to what amount.

Cost Estimate for FY 2002: $40,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 8	STATE STUDY NO. 133
TOTAL STUDY BUDGET: $97,276	TOTAL STUDY COST TO DATE: $46,228
DATE STARTED: 10/01/99	COMPLETION DATE: 09/30/04
STUDY TITLE:	Soil Stabilization Field Trial
RESEARCH AGENCY:	University of Mississippi (This study will be conducted jointly with the Portland Cement Association sharing costs)
PRINCIPAL INVESTIGATOR:	K.P. George

Objective:
A field trial is proposed to investigate the effectiveness of fly ash or other methods such as pre-cutting the base at regular intervals or pre-cracking in mitigating the shrinkage-cracking problem in soil-cement. The Department has been using lime-fly ash (LFA) for stabilization of bases, and this field study will compare the performance of cement sections with LFA included in the program.

The research study is proposed to have a field trial incorporating one section of cement, another of reduced cement and fly-ash, a third section with pre-cut cement layer, a fourth section with induced pre-cracking, a fifth section incorporating lime and fly-ash, and the last section with ground granulated blast furnace slag as an additive.

Progress:
A literature review has been performed to review any previous research that would relate to the study. A project was identified for the test sections on MS 302 in Marshall County. Samples of the select material from this project location obtained and laboratory tests performed. Mix designs for each test section were composed based on these laboratory test results.

Six test sections were constructed and samples molded from the field-mixed material for strength testing at 7, 14, 28 and 90 days. Moisture/density testing of the in-place material was performed at the time of construction. Geogauge, FWD (performed by MDOT) and Clegg hammer testing was performed, and crack surveys obtained, over a 28-day monitoring period prior to placement of the asphalt base course. Twenty eight-day field cores were also collected and tested for unconfined compressive strength. Backcalculations of pavement layer moduli from FWD deflection basins were performed and these results compared to Geogauge results. An interim report was published by the principal investigator.

Plans for FY 2002:

Long term monitoring of the sections will begin. For this fiscal year, crack mapping of the asphalt surface will be conducted. FWD tests on all six test sections will be performed, and if any cracks are present in the asphalt surface, a few FWD tests will be conducted to investigate the load transfer efficiency of these cracks. Field cores will be obtained and tested for unconfined compressive strength. A technical memorandum will be prepared describing the performance of each section.

Cost Estimate for FY 2002 $27,000

The PCA and the University of Mississippi are providing funds to supplement this effort.

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PART II

LINE ITEM NO. 9	STATE STUDY NO. 134
TOTAL STUDY BUDGET: $75,000	TOTAL STUDY COST TO DATE: $35,748
DATE STARTED: 05/01/99	COMPLETION DATE: 09/30/02
STUDY TITLE:	In-House Support to State Study No. 131
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:
This study is being conducted to support State Study No. 131 "Subgrade Characterization for Highway Pavement Design" which is the contract underway with the Department of Civil Engineering at the University of Mississippi (UM). Most of the laboratory and field testing to support the contract study will be conducted by this in-house study. In addition, this study will provide the test data to correlate the Dynamic Cone Penetrometer (DCP) to the Automated DCP.

Progress:
Progress of field construction activities related to State Study No. 131 was monitored. Support was provided as required to the principal investigators of State Study No. 131.

Reviewed the final draft of the report for this study. Reviewed the preliminary draft of the manual supporting the DCPAN software.

Plans for FY 2002:
Review the final draft of the manual supporting the DCPAN software. Coordinate efforts to expand the capability of the DCPAN software to include field data obtained from use of the manually operated dynamic cone penetrometer.

Cost Estimate for FY 2002 $5,000

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PART II

LINE ITEM NO. 10	STATE STUDY NO. 136
TOTAL STUDY BUDGET: $200,000	TOTAL STUDY COST TO DATE: $99,262
DATE STARTED: 04/06/99	COMPLETION DATE: 12/31/01
STUDY TITLE:	Master Testing Agreement
RESEARCH AGENCY:	Fugro-BRE, Inc., Reed and Graham, Inc. and Burns, Cooley and Dennis, Inc.
PRINCIPAL INVESTIGATOR:	John W. Avent and Randy L. Battey

Objective:
The objective of this study is to provide engineering services for laboratory tests and analysis of samples and materials generated from projects and research studies. These services will provide for testing and characterization of hot mix asphalt mixture and binder, portland cement concrete, bound and unbound granular materials and soils in accordance with testing and reporting protocols of designated tests promulgated by the Strategic Highway Research Program Long-Term Pavement (SHRP-LTPP).

Progress:
The results from round one and two of testing were received and forwarded to SHRP-LTPP for their data set. Due to the relatively small quantity of material remaining to be tested, samples were sent to only Fugro-BRE, Inc. for the third round of testing.

Plans for FY 2002:
The results of the third round of testing will be received and forwarded to SHRP-LTPP. This will complete all activities related to this study.

Cost Estimate for FY 2002 $11,000.

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PART II

LINE ITEM NO. 11	STATE STUDY NO: 138
TOTAL STUDY BUDGET: $75,000	TOTAL STUDY COST TO DATE: $8,202
DATE STARTED: 10/01/99	COMPLETION DATE: 09/30/04
STUDY TITLE:	In-House Support to State Study No. 133
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:
This study will be conducted to support State Study No. 133 "Soil Stabilization Field Trial" which is a proposed contract with the Department of Civil Engineering at the University of Mississippi. The field site location, layout, and sampling to support the contract study will be conducted by this in-house study.

Progress:
Federal Aid Project No. NH-0021-01(104)PH2 was selected as the project for the current study test sections. The project site is located on MS 302 between the Desoto/Marshall County line and US 72 in Marshall County. Meetings were conducted with the principal investigator of State Study No. 133, the Contractor/Subcontractors and MDOT personnel to ensure that the objectives of State Study No. 133 and the field methodologies utilized to meet these objectives were understood by all parties involved in the study. Samples of the select material from the project were obtained and submitted to the University of Mississippi for the required laboratory testing.

The construction of the various test sections was coordinated by MDOT and included a cement treated control section, cement treated with application of a vibratory roller, cement and fly-ash, lime-fly ash, ground granulated blast furnace slag, and a cement treated section precut at 10-ft. intervals. The Department's falling weight deflectometer (FWD) was utilized for testing of the subbase prior to placement of the first lift of asphalt.

The final draft of the interim report was reviewed.

Plans for FY 2002:
Provide support as required by the principal investigator for long term monitoring of the test sections. For this fiscal year, this includes MDOT testing these sections with the falling weight deflectometer (FWD) and field coring to obtain cores for unconfined compressive strength testing. Review technical memorandum.

Cost Estimate for FY 2002 $12,000

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PART II

LINE ITEM NO. 12	STATE STUDY NO: 140
TOTAL STUDY BUDGET: $24,500	TOTAL STUDY COST TO DATE: $14,837
DATE STARTED: 10/01/99	COMPLETION DATE: 09/30/02
STUDY TITLE:	Evaluation of E-Krete for Rut Filling
RESEARCH AGENCY:	Polycon, Inc. and Research Division, Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:
Rutting of asphalt pavements presents a serious problem for highway agencies worldwide. There are several ways to rehabilitate rutted asphalt pavement, including milling by itself, milling and overlay, overlay without milling, and rut filling. Rut filling with various materials, primarily asphalt based, has been done for several years.

A new material E-Krete, manufactured by a Mississippi Corporation, Polycon, Inc., is under evaluation as bridge deck surface treatment and for spall repair on concrete pavement and structures. E-Krete is a Portland cement based material that has excellent adhesion properties. A 375-foot test section of E-Krete was installed, at Polycon's expense, in a severely rutted section of the outside lane of the northbound lanes of I-55 in August 1999. This problem statement is for a more carefully engineered evaluation of E-Krete for rut filling.

Progress:
A rutted 1500-foot length of U.S. Highway 49 Southbound in Madison County between the two southern-most relief bridges of the Big Black River was selected for this study. Various application techniques were experimented with and documented with the goal of determining the method that would provide the highest level of performance. Initial distress surveys and friction testing have been performed and documented for inclusion in the final report upon completion of the study.

Plans for FY 2002:
Continued monitoring and documentation of the test sections will be performed. A report will be generated and distributed to various interested agencies.

Cost Estimate for FY 2002 $5,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 13	STATE STUDY NO. 141
TOTAL STUDY BUDGET: $44,000	TOTAL STUDY COST TO DATE: $12,541
DATE STARTED: 05/01/00	COMPLETION DATE: 12/31/02
STUDY TITLE:	Performance of Polymer Modified Hot Mix Asphalt Pavements – An Extended Evaluation
RESEARCH AGENCY:	Ergon Technical Development and Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Mike Hemsley and Randy L. Battey

Objective:
The objective of this research project is to continue observation and evaluation of the Polymer Modified Pavement Field Trial sections, located on I-55 northbound near Grenada, MS, for an additional 3 years in order to study any additional or new pavement distresses. This study will evaluate the modifiers in each of the sections, which include five different polymer sections, two crumb rubber sections, a gelled asphalt section and a section with no modifier to serve as the control section. Information gained from this research in using polymers and modifiers to overcome premature rutting and other distresses will continue to set Mississippi as on of the leaders in this field of study. It should be noted that Ergon Technical Development will provide all laboratory testing at no cost to the Mississippi Department of Transportation.

Progress:
Field operations began in May 2000 and comprised of cutting 152 – 6" cores, performing 90 sand patch tests, gathering rut data, performing friction testing and mapping the distresses in the test sections. All 152 cores were delivered to Ergon Technical Development for testing. Ergon reported all results from round one testing to the MDOT.

A second round of field operations was performed in June 2001 and comprised of cutting 46 – 6" cores, performing 90 sand patch tests, gathering rut data, performing friction testing and mapping the distresses in the test section. All 46 cores obtained during the second round of field operations were delivered to Ergon Technical Development for testing.

Plans for FY 2002:
Ergon Technical Development will complete their testing protocol on the 46 cores that were gathered in the 2nd phase of field operations and report their test results to the MDOT. A third round of field operations will be performed in the Spring of 2002.

Cost Estimate for FY 2002 $12,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 14	STATE STUDY NO. 142
TOTAL STUDY BUDGET: $34,000	TOTAL STUDY COST TO DATE: $1,300
DATE STARTED: 05/01/00	COMPLETION DATE: 12/31/02
STUDY TITLE:	Evaluation of Crumb Rubber Modified Hot Mix Asphalt on a County Road
RESEARCH AGENCY:	Mississippi Department of Transportation, Hinds County Public Works Department and Mississippi Department of Environmental Quality
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:
The abundant surplus of vehicle tires still presents a problem for Mississippi, as well as other states. The Hinds County Department of Public Works recently recognized this problem and approached the Mississippi Department of Environmental Quality (DEQ) concerning a joint venture to construct a crumb rubber modified hot mix asphalt overlay of a county road. The intent is to use available research funds from DEQ in support of Hinds County Public Works road program to construct the project. PolyVulc, a Vicksburg, MS company who processes waste tires into crumb rubber for various uses, was selected to provide the crumb rubber. The MDOT Research Division was requested by both financial supporters, as well as the crumb rubber supplier, to facilitate the design, oversee the construction and to evaluate the performance.

The objective of this research project is to evaluate the performance of a crumb rubber modified hot mix asphalt overlay on a low volume two-lane road. The purpose is for the crumb rubber modifier to enhance the pavement's ability to resist distresses resulting from environmental factors. This project will use the wet process for incorporating the crumb rubber modifier into the hot mix asphalt.

Progress:
The route chosen for this project is the connector between Clinton, MS and Raymond, MS, which is 4.5 miles in length and comprised of two 10-foot lanes. Three 1-mile test section locations have been selected and preoverlay data collected of the existing pavement surface. This data includes rut measurements and crack surveys.

The following table describes the section layout:

Distance	Section
0 – 1 mile	3% CRM
1 – 1½ mile	Control
1½ - 2½ miles	5% CRM
2½ - 3 miles	Control
3 – 4 miles	7% CRM
4 – 4½ miles	Control

The proposed overlay thickness is 2 inches.

Plans for FY 2002:
Construction of the test sections by the Hinds County road crew will be monitored and documented by MDOT. Rut measurements, distress surveys and skid friction testing will be performed periodically by MDOT subsequent to this construction.

Cost Estimate for FY 2002 $10,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 15	STATE STUDY NO. 144
TOTAL STUDY BUDGET: $50,000	TOTAL STUDY COST TO DATE: $26,704
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/02
STUDY TITLE:	Profilograph Specification Study
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:
The current roughness specification utilized by the MDOT was developed over 10 years ago and there have been no significant changes since. The specification was developed based on the manual profilograph, which has since been replaced by the automatic unit. Also, unlike 10 years ago, industry is now utilizing high frequency rollers to compact their hot mix asphalt pavements. These rollers have a propensity for creating small scallops in the pavement surface, which due to the blanking band requirement in the current roughness specification are not taken into account when computing a profile index. However, these scallops are certainly felt by the traveling public and create a rougher ride quality. Based on the current specification, industry is not being penalized for a rough ride quality and in some instances contractors are being rewarded with incentive pays for a rough final ride surface. Most states have removed the blanking band from their roughness specification for this very reason. Many of the states have gone to the light weight profiler for their QC/QA of ride quality. The MDOT intends on utilizing the light weight profiler, which instead of producing a profile index value measures the International Roughness Index (IRI). This transition will take some time with undoubtedly a period of time where a dual specification (light weight profiler and profilograph) is in place. If the MDOT is to ever successfully make this transition, the current profilograph specification must be "tightened up" and data must be gathered comparing profile index values to IRI for Mississippi pavements.

Progress:
Roughness data has been gathered from approximately twenty (20) projects utilizing the "California type" profilograph, South Dakota type road profiler and the AARB walking profiler. Using this information the department has tentatively revised the current 907-403-12 and the 907-401-22 specifications with regards to surface smoothness. The major change involved in this proposed update is the removal of the .2" blanking band for Profile Index computation. The bump requirement has also been changed from .4" per 25' to .3" per 25' for all pavements. The updated specifications should be in place during FY 2002. The department has advertised for the purchase of a light weight profiler which will be capable of collecting both PI and IRI. The equipment should be available during FY 2002.

Plans for FY 2002:

Phase II of this study will involve proof testing the newly acquired light weight profiler and to approve the equipment for collection of PI data on MDOT projects. Plans will also be made to begin the transition from PI to IRI for smoothness acceptance utilizing the light weight profiler.

Cost Estimate for FY 2002 $50,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 16	STATE STUDY NO. 145
TOTAL STUDY BUDGET: $86,000	TOTAL STUDY COST TO DATE: $14,377
DATE STARTED: 10/01/00	COMPLETION DATE: 03/31/02
STUDY TITLE:	The Effect of End-Point Compaction on Superpave Mix Designs
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	Tom White

Objective:
With fixed contact pressure and gyration angle, Superpave compaction effort is controlled by number of gyrations. Traffic level determines the desired initial (N_{ini}), design (N_{des}) and maximum (N_{max}) number of gyrations. Design asphalt content is selected at N_{des}. The initial Superpave protocol specified that specimens are compacted to N_{max} and the bulk density at N_{des} is interpolated based on specimen change in height. This approach is reasonable for some mixtures, however the change in height may not be linear for other mixtures, which could lead to an error in volumetric determinations. There is thought of changing the protocol to call for specimens to be compacted to N_{des} for selecting design asphalt content. After the design asphalt content is selected then the mixtures are compacted to N_{max}, to confirm air voids will be adequate through the mixture service life. There is industry concern about the effect of this change on design asphalt contents.

Progress:
Contact has been made with aggregate suppliers. Typical gradations and aggregate data have been obtained. Some of the information is being verified and information on typical mix designs has been received. Our library of standard test methods is being completed. Through discussion with the MDOT Materials Division a decision has been made to include five to ten percent RAP in each mix design. Ergon Refining has supplied asphalt for the project. Two asphalts are being utilized; PG 67-22 and polymer modified PG 76-22.

A test matrix has been developed to incorporate factors identified in the research proposal. The matrix also addresses comments from discussions with MDOT Research and Materials Divisions. The matrix is shown on the following page.

			Gradations (Referenced to Restricted Zone)											
			19 mm						**12.5 mm**					
			Above/Through			Below			Above/Through			Below		
			SS	LS	GR	SS	LS	GR	SS	LS	GR	SS	LS	GR
Asphalt Binders	**PG 76-22**	$N_{des\ 2}$												
		$N_{des\ 1}$												
	PG 67-22	$N_{des\ 2}$												
		$N_{des\ 1}$												

SS: Sandstone
LS: Limestone
GR: Chert Gravel

PG 67-22: Neat Asphalt
PG 76-22: Polymer Modified Asphalt
N_{des}: Number of revolutions for design characteristics

Plans for FY 2002:
Mix designs will be conducted at N_{des}. Additional specimens will be compacted to N_{max}. An analysis of design asphalt contents will be made and the differences will be quantified.

Cost Estimate for FY 2002 $66,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 17	STATE STUDY NO. 146
TOTAL STUDY BUDGET: $80,000	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/03
STUDY TITLE:	Updating Mississippi Flood Frequency Reports
RESEARCH AGENCY:	United States Geological Survey
PRINCIPAL INVESTIGATOR:	K. Van Wilson

Objective:
Knowledge of magnitude and frequency of floods is essential to the design of bridges, highway embankments, culverts, levees, dams, and other structures near streams. Effective flood-plain management and determination of flood insurance rates require accurate information on magnitude and frequency of floods.

The statewide flood-frequency reports by Landers and Wilson (1991) and Wilson and Landers (1991) provided estimates of magnitude and frequency of floods at gaging stations and provided techniques for estimating magnitudes and frequency of floods at ungaged sites in Mississippi. Observed annual peak-flow data collected through 1988 at 358 gaging stations were used in the analyses. Since the 1991 statewide flood-frequency reports, an additional 11 years of observed annual peak-flow data has become available and data have been collected on several large floods. Also, the 1991 regional flood-frequency equations were developed using generalized least-squares (GLS) regression (Stedinger and Tasker, 1985; and Tasker and Stedinger, 1989). GLS regression had and still has advantages over the ordinary least-squares and weighted least-squares regression, but since the 1991 reports, Tasker and Slade (1994) demonstrated that GLS regression coupled with a site-specific approach [referred to as “interactive” by Tasker and Slade (1994) and as “region-of-influence” by Hodge and Tasker (1995)] had smaller root-mean-square errors than the traditional geographic regional approach. Analyses of flood frequency using these additional data with a site-specific approach may substantially change and improve the accuracy of techniques for estimating magnitudes and frequencies of floods in Mississippi.

Progress:
Research of flood-frequency techniques and compilations of flood data, including maximum known flood data, were continued. Multiple reports that describe the extreme flood events during the 20th century were scanned into highly compressed image file format. A preliminary summary of the significant flooding that occurred in Mississippi for 1994-98 was completed and submitted to the MDOT for review.

Plans for FY 2002-FY 2003:
The objectives of this project are to prepare an updated version of the flood-frequency reports that would:

- Document the maximum known flood at gaged sites in Mississippi and compare with a previously published envelope curve;
- Document flood data and flood-frequency estimates at gaging stations in Mississippi; and
- Present methods for estimating the magnitude and frequency of floods in Mississippi having recurrence intervals ranging from 2 to 500 years.

Tidal record data along the Mississippi Gulf Coast will also be included. See the following web address for examples of data: http://wtsodin.er.usgs.gov/camille/

Estimated Costs:
The project will be done in cooperation with the MDOT, Research Division. The 3-year project will begin October 1, 2000, and will end September 30, 2003. It is anticipated that the results of this project will be reviewed and discussions toward renewal after 2003 will be made to include additional GIS work on automated basin delineation, which is currently in the development stages. The total estimated cost of the project is $160,000 distributed over three Federal Fiscal years (October 1 to September 30) as follows:

	2001	2002	2003	Total
MDOT	$ 20,000	$ 30,000	$ 30,000	$ 80,000
USGS	$ 20,000	$ 30,000	$ 30,000	$ 80,000
Total	$ 40,000	$ 60,000	$ 60,000	$ 160,000

The availability of Federal matching funds is difficult to predict, but we will make every effort to secure funds to match all or part of the State funds. If Federal matching funds vary from those shown for each year, then the MDOT and USGS can discuss alternatives, such as, reducing scope or extending the time of the project.

Products:
Reports will be published that contain maximum known flood data, annual peak-flow data, flood-frequency estimated at gaging stations, and equations and (or) computer programs for estimating the magnitude and frequency of annual floods in Mississippi.

The reports will be provided in paper form (with a diskette or CD) and will also be made available in digital form on the Internet.

Cost Estimate for FY 2002 $30,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 18	STATE STUDY NO: 147
TOTAL STUDY BUDGET: $93,348	TOTAL STUDY COST TO DATE: $71,920
DATE STARTED: 10/01/00	COMPLETION DATE: 03/31/02
STUDY TITLE:	Long Term Effect of Lime Fly Ash Treated Soils
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:
For approximately 20 years, the Mississippi Department of Transportation has been utilizing lime fly ash in base course construction. Recently questions as to the long-term effect lime fly ash has on soil strength and stability have been raised. This study intends on answering those questions by performing the following two tasks:

- A thorough literature search will be performed to determine what other agencies have discovered based on their experiences with lime fly ash treated bases that are over 10 years in age.
- Mississippi constructed several of their early lime fly ash treated bases as part of "Demonstration" or Research projects. These projects were well documented and the strength of the bases at the time of construction is known. As part of this project these early sites will be revisited and core samples will be taken. A comparison of the present day core properties will be made to the earlier data.

Upon completion of these two tasks, a comprehensive report will be generated detailing the findings of the study. It is estimated that it will take approximately one year to complete this research.

Progress:
This study was substantially expanded in scope subsequent to its initiation due to information obtained during the literature search. This information identified issues relevant to the performance of lime-fly ash (LFA) stabilized soil base and subbase course construction. These issues include: The determination of in-situ structural layer coefficients of LFA stabilized soil base/subbase material and comparison of these values to the design value, the effect of late-season construction of this stabilized material on its subsequent performance, and the development of autogeneous healing in this material. In addition, factors were identified to improve the performance of this material.

Nine existing pavements were tested with the falling weight deflectometer (FWD) and pavement coring was performed at each of those locations tested with the FWD. A computational procedure based on the 1993 AASHTO Guide for Design of Pavement Structures was utilized to determine the in-situ structural layer coefficient of the LFA stabilized soil base/subbase course materials. Intact LFA cores were tested for unconfined compressive strength. Three of the nine projects had both late season and subsequent construction season LFA stabilized material placed during the course of construction.

An extensive laboratory testing program was developed and implemented to further address the late-season construction issue and the relationship between compacted density and strength of LFA stabilized material.

All field testing and most of the laboratory testing associated with this study has been completed. Data analysis of the test results obtained to date continues but is not complete.

Plans for FY 2002:
Complete laboratory testing program and all data analysis. Publish a final report of the research conducted in this study.

Cost Estimate for FY 2002 $14,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 19	STATE STUDY NO: 148
TOTAL STUDY BUDGET: $250,000	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/02
STUDY TITLE:	Crash Testing Mississippi's Temporary Barrier Systems
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:
The Federal Highway Administration (FHWA) has required all states to have it's traffic control devices utilized in work zones to be crashworthy according to the testing and acceptance guidelines of the National Cooperative Highway Research Program (NCHRP) Report 350. As part of this mandate, all temporary barrier systems must meet the requirements of NCHRP 350 by October 1, 2002. Mississippi has not crash tested it's current precast temporary barrier system to determine if it is in compliance with NCHRP 350. The main component in question is our current "pin and loop" connection between adjacent barrier units. This study will determine, based on crash testing, if modifications to Mississippi's current standard temporary barriers are necessary for compliance with NCHRP 350.

Progress:
Discussions with Roadway Design and FHWA concerning the possibility of a pool-funded effort among states with similar temporary barrier systems were undertaken. The FHWA is investigating the possibility of sharing the cost with multiple states that are faced with the same situation. Since it would be cost effective to share this expense with other states that utilize the same type temporary barrier, the department has not utilized any SPR funds to date related to this study.

Plans for FY 2002:
If the department is unable to partner with any other organizations to share the cost of crash testing our barrier section, then MDOT will alone be responsible for the cost of testing the barrier. However, should partners be identified, the MDOT will enter into a "pool fund" study to perform this testing. To be conservative, this Work Program has been developed under the assumption that the MDOT will be responsible for the entire cost of crash testing the barrier section.

Cost Estimate for FY 2002 $100,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 20	STATE STUDY NO: 149
TOTAL STUDY BUDGET: $52,600	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 01/01/03
STUDY TITLE:	Development of a Transportation Kit for Elementary Students
RESEARCH AGENCY:	Mississippi Department of Transportation Human Resources Division

PRINCIPAL INVESTIGATOR: Danada McMurtry

Objective:
The current available pool of qualified applicants for jobs in transportation is inadequate in meeting industry demands. It is estimated that this inadequacy will grow over the next 20-50 years. It is important to create an awareness of the field at the earliest age possible in order to adequately equip students with the academic skills necessary to enter the field. This study will involve the design of a program to increase elementary (K-6) students' awareness of career opportunities in the field of transportation and civil engineering. The program will address learning objectives across the curriculum including math, science, social studies, reading, music, art and history. Included in this study will be the development of a teachers' guide, a "transportation kit" and an age-appropriate video.

Cost Estimate for FY 2002 $42,080

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 21	STATE STUDY NO: 150
TOTAL STUDY BUDGET: $95,386	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 09/30/03
STUDY TITLE:	Automated Accident Detection at Intersections
RESEARCH AGENCY:	Mississippi State University Transportation Research Center

PRINCIPAL INVESTIGATOR: Yunlong Zhang

Objective:
Traffic incidents cause over half of the highway delays to motorists. On urban surface streets, the majority of traffic accidents occur at or near intersections. This study will involve the collection of normal traffic sound signals at intersections, and the development of novelty detection algorithms to predict accident occurrences when abnormal acoustic signals associated with accidents are being recorded. Quick and accurate detection of an accident at an intersection is essential for the necessary medical and emergency response to be provided in a most timely manner. By shortening detection and notification time of the accident, along with reduced incident response time due to accurate incident information, the system can reduce the accident clearance significantly and therefore reduce congestion and delays.

Cost Estimate for FY 2002 $81,078

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 22	STATE STUDY NO: 151
TOTAL STUDY BUDGET: $99,650	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 09/30/04
STUDY TITLE:	Sample, Describe, and Map Yazoo Clay
RESEARCH AGENCY:	Mississippi Department of Transportation Materials Division

PRINCIPAL INVESTIGATOR: Richard V. Martin

Objective:

The Yazoo Clay is notorious as a problem in Central Mississippi and in particular the Greater Jackson area. Its high-volume-change properties can have a devastating effect on roads, buildings, bridges, and embankments. The Yazoo Clay has never been studied systematically to determine what controls its properties and what is the distribution of these properties. All efforts have been local in nature and problem oriented. This study will seek to define the areal limits and stratigraphic units of the Yazoo Clay deposit based on engineering properties. These units can then be mapped showing the distribution of these engineering properties. A map showing this distribution will serve as a basis for designing solutions for projects located in a given unit. Also included in the study will be an analysis of how effective the current MDOT design policies with regards to Yazoo Clay have been and recommendations will be made as to any changes to the current policy that could be made.

Cost Estimate for FY 2002 $31,150

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 23	STATE STUDY NO: 152
TOTAL STUDY BUDGET: $108,000	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 09/30/03
STUDY TITLE:	Determination of the GeoGauge Effectiveness in Measuring Stiffness and Modulus Gain of Lime-Fly Ash Stabilized Soil
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division

PRINCIPAL INVESTIGATOR: William F. Barstis

Objective:
The GeoGauge is a hand-portable, non-nuclear, non-destructive testing device that directly and rapidly measures the stiffness of soils and soil-aggregate mixtures. The resulting stiffness measurements can be used to directly determine Young's modulus and shear modulus of the tested material. MDOT is participating in the SPR-2 (212) GeoGauge Pool Fund Study. MDOT has been asked to participate in Research Task 3D "Determination of the GeoGauge effectiveness in measuring strength gain of chemically-stabilized soils and bases". MDOT has constructed over 100 projects during the past 15 years involving the use of Lime-Fly Ash (LFA) stabilized soil for base and subbase pavement layers. This proposed study addresses MDOT's research efforts supporting Task 3D by evaluating the stiffness and modulus gain of this commonly used construction material. Characterizing the modulus of this material in a rapid manner is necessary for use in the mechanistic/empirical flexible pavement design procedures being reviewed for adoption in the 2002 AASHTO Guide for Design of Pavement Structures.

Cost Estimate for FY 2002 $88,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 24	STATE STUDY NO: 153
TOTAL STUDY BUDGET: $109,874	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 06/30/03
STUDY TITLE:	Falling Weight Deflectometer for Estimating Subgrade Moduli
RESEARCH AGENCY:	University of Mississippi
PRINCIPAL INVESTIGATOR:	K.P. George

Objective:

Characterizing the subgrade in terms of resilient modulus (M_r) is essential for AASHTO pavement design/evaluation. Due to the complexity of the laboratory M_r test procedure, highway agencies have been exploring Non Destructive Tests (NDT), such as the Falling Weight Deflectometer, (FWD), to determine the M_r of a given material. In this study, four test sections with subgrade reflecting a range of soil types (fine- and coarse- grain soils) will be tested with FWD measurements obtained directly on the prepared subgrade. Shelby tube samples of subgrade material will be obtained for laboratory M_r testing and Dynamic Cone Penetrometer (DCP) field testing will be conducted. Employing the Modulus backcalculation program, M_r of the subgrade layers will be calculated and compared first with the laboratory M_r values and second with the M_r values derived from the DCP index. The results will be statistically analyzed exploring how closely the FWD-backcalculated values agree with the laboratory M_r values. The M_r-DCP index relationship, recently derived in State Study # 131, will also be substantiated. This proposed study fundamentally differs from SS #131 in that the FWD test apparatus, equipped with a much larger plate than that used in the previous study or used for routine FWD pavement testing, is the field testing equipment being employed for modulus characterization. The need for a larger plate was determined in the previous study during field testing directly on untreated subgrade. In this previous study, the Automated DCP was the primary field testing equipment evaluated for modulus characterization. In summary, this proposed study offers another, potentially more accurate and faster, method of subgrade characterization for pavement design.

Cost Estimate for FY 2002 $54,701

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 25	STATE STUDY NO: 154
TOTAL STUDY BUDGET: $32,000	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 06/30/03
STUDY TITLE:	In-House Support to State Study 153
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:
This study is being proposed to support the proposed study "Falling Weight Deflectometer for Estimating Subgrade Moduli". Most of the field testing to support the contract study will be conducted by this in-house study. Engineering time is also allocated for reviewing the draft and final report copies submitted by the Principal Investigator of the contract study.

Cost Estimate for FY 2002 $27,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 26	STATE STUDY NO: 155
TOTAL STUDY BUDGET: $115,000	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 09/30/03
STUDY TITLE:	Use of Asphalt Pavement Analyzer to Study In-Service Asphalt Mixture Performance
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	Tom White

Objective:
Aggregates and their combination into mixture gradations are significant variables affecting the rutting potential of an asphalt mixture. Because aggregates vary from state to state, it is important to evaluate Asphalt Pavement Analyzer (APA) rutting criteria for local aggregates. Another issue is whether laboratory compaction will produce test specimens with the same magnitude of rutting as field compacted specimens. This study addresses both of these issues. Cores will be taken from in-service pavements for APA testing and for extraction to determine asphalt content and aggregate gradation. Specimens with the same gradation and asphalt grade and content will be prepared, compacted and tested in the APA using aggregates obtained from the same sources as used in the in-service pavements. An analysis will be conducted to determine if there are differences in rutting of field and laboratory compacted specimens. Appropriate APA rutting criteria will be recommended for asphalt mixtures utilizing aggregates available in Mississippi.

Cost Estimate for FY 2002 $48,125

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 27	STATE STUDY NO: 156
TOTAL STUDY BUDGET: $20,000	TOTAL STUDY COST TO DATE: $0
DATE STARTED: 10/01/01	COMPLETION DATE: 09/30/02
STUDY TITLE:	Bridge Deck Cracking
RESEARCH AGENCY:	Mississippi Department of Transportation Materials Division
PRINCIPAL INVESTIGATOR:	Mike O'Brien

Objective:
There is a nationwide problem with concrete bridge deck cracking. Drying shrinkage of reinforced concrete creates cracks, which allow moisture and salts to infiltrate around the reinforcing steel. The moisture and salts accelerate the deterioration of the structure through corrosion of this reinforcement. In this study the drying shrinkage of concrete mixes, blended with different materials and admixtures, will be measured. The quantification of this shrinkage will aid in identifying a maximum allowable drying shrinkage for bridge deck construction.

Cost Estimate for FY 2002 $20,000

MISSISSIPPI SPR-1(38)
PART II

LINE ITEM NO. 28 STATE STUDY NO: N/A

TOTAL STUDY BUDGET: $25,000 TOTAL STUDY COST TO DATE: $0

DATE STARTED: 10/01/01 COMPLETION DATE: 09/30/02

STUDY TITLE: Minor Research Studies

RESEARCH AGENCY: Mississippi Department of Transportation
Research Division

PRINCIPAL INVESTIGATOR: Randy L. Battey

Low cost/short duration projects may be done without being put into a process of clearances and competing with other programs. An example of such a project is an experimental feature evaluation.

The Research Advisory Committee will establish a resource threshold to be met before requiring any project be put into a centralized clearinghouse/priority setting process. Current operating procedures are to conduct research projects where the expenditure ceiling is expected to be under $10,000 and the project duration is expected to be one year or less.

These are based on selection and approval by the Research Engineer, following an appropriate review of District needs and literature review.

These research projects are short-term, and will employ only MDOT personnel in the research project. Brief, concise work plans will be developed for each of these projects.

Cost Estimate for FY 2002 $25,000

MISSISSIPPI PARTICIPATION IN NCHRP

The Mississippi Department of Transportation contributes to the National Cooperative Highway Research Program (NCHRP). NCHRP is a special-purpose program administered by the Transportation Research Board (TRB) under a three-way agreement among the National Academy of Sciences, AASHTO, and the FHWA. Funding is provided by state highway and transportation agencies at a rate of 5.5% of the agencies' SPR funds. Funds for this participation are 100% Federal and thus contain no state match. These pooled funds are used to fund research aimed at solving national or regional problems and can only be spent on problems approved by at least two-thirds of the states. Formal solicitations are made from the states, AASHTO committees, TRB committees and FHWA to develop problem statements. Estimated contribution for FY 2002 is **$359,200**.

MISSISSIPPI'S SECOND ROUND OF PEER EXCHANGE

The State Planning and Research Program Administration regulations (23 CFR Part 420) became effective on August 22, 1994. Subpart B requires the States to conduct a peer review (exchange) of their research and technology (R & T) management process on a periodic basis. Mississippi's first round peer exchange was held in June of 1998. Mississippi's second round peer exchange will be held in FY 2002.

The program is designed to send an outside team of invited top level managers to meet with the host agency to discuss and review its RD&T management processes. Information on the host agency and team members' RD&T policies and procedures are exchanged with the intent to improve the overall RD&T management process. Peer exchanges provide an opportunity for participants to share best practices and management innovations with each other. The information gathered from the exchange is presented to agency management.

Mississippi State University (MSU) will provide assistance to MDOT in conducting this required peer exchange program. Specifically, MSU will be reimbursed for the following functions related to this line item:

- Organizing the Event
- Reimbursing the Peer Exchange Participants Travel Cost
- Providing Lodging, Meals and Meeting Space for the Participants
- Preparing and Distributing a Final Report
- Providing Ground Transportation for Participants

Cost Estimate for FY 2002 $15,000

POOLED FUND STUDIES

Pooled Fund Study: ***Southeast SUPERPAVE Center***

Host Agency - Alabama Department of Transportation

The objective of this pooled-fund study will be to support the implementation of the products of the SHRP research effort within the state DOTs through the ***Southeast SUPERPAVE Center***. Each state can select from a list of services that will best satisfy their needs. The list includes:

- Develop and provide, for the DOTs and Industry, training on the volumetric analysis of HMA pavements using the Superpave Gyratory Compactor.
- Conduct at least 1 (more if needed) four day Superpave binder school at NCAT.
- Provide troubleshooting expertise to the states on the development of Superpave designs - both over the phone and as required by visits to the DOT laboratory and/or project site.
- Provide support for implementation of Superpave by conducting round robin studies to evaluate the accuracy of laboratories within the region.

If additional work is needed, each state can determine from the list of services the cost for performing this additional work.

FY 2002 - $20,000

Pooled Fund Study: ***Compatibility of Liquid Asphalts with Different Aggregate Used in Mississippi Related to Stripping Susceptibility***

Host Agency - Alabama Department of Transportation

As a standard practice, the MDOT requires the use of lime in hot mix asphalt mixtures to combat moisture induced damage. However, even with the use of lime, some pavements have still had premature distressing (stripping) due to moisture damage. A potential cause of this premature stripping is an incompatibility between some asphalt binder-aggregate combinations. A total of 60 mixtures will be evaluated for this study. A full factorial experiment including five aggregates (2 variations of native chert gravel, limestone, sandstone and granite), three asphalt binders (2-PG 67-22 binders and a polymer modified PG 76-22), two nominal maximum aggregate sizes (12.5mm and 19mm) and two gradation shapes (above & below the maximum density line). The total estimated cost is $143,298 over a two-year period.

FY 2001 - $71,649 FY 2002 - $71,649

Pooled Fund Study: **LTPP SPS8 WIM Calibration and Data Processing**

Host Agency - FHWA

The Long Term Pavement Performance (LTPP) Program was initiated as a part of the Strategic Highway Research Program in 1987. The intent was a 20-year study of pavements that would provide the highway community with the information it needed to design, build and maintain cost-effective and long lived pavements. Mississippi is one of 37 states and provinces participating in the LTPP Specific Pavement Studies (SPS). A core objective of these studies is to quantify relationships between pavement performance, truck volumes and axle loading. It is essential to quantify these relationships if we are to make progress in improving our ability to predict the long-term performance of our Interstates and other major highways. Unfortunately, the states and provinces have fallen behind in collecting the required traffic data and successful achievement of this goal is in serious jeopardy. The Transportation Research Board's LTPP Committee, which oversees the program on behalf of the states and provinces, has concluded that the current traffic data collection provided by the states and provinces is proving inadequate to maintain effective SPS experiments. The recommendations by the LTPP Committee propose major changes in the SPS traffic data collection effort. These changes will require uniform national standards for the acquisition, installation, calibration and operation of WIM/AVC equipment, as well as the timely processing of the resulting data. The total estimated cost of implementing the recommendations through FY 2003 nationally is $10 million, however Mississippi's cost for their SPS sites in FY 2001-FY 2003 is $19,000.

FY 2001 - $9,000 FY 2002 - $5,000 FY 2003 - $5,000

Pooled Fund Study: ***Non-Nuclear Testing of Soils and Granular Bases Using the GeoGauge***

Host Agency - FHWA

The Soil Stiffness Gauge, GeoGauge, is a non-nuclear, non-destructive testing device that directly and rapidly measures the stiffness of soils and soil-aggregate mixtures. This stiffness can be used to directly determine Young's and shear modulus and can be used in conjunction with a moisture measurement to determine density. Users of the GeoGauge have reported the following benefits:

- Relatively simple to use with minimal training required;
- Eliminates licensing/interstate issues related to nuclear-based devices;
- Relatively low price compared to nuclear gauge;
- Has the ability to measure a key, albeit elusive, engineering property;
- Allows an increase in lot sample size, thereby quantifying material and evaluating subgrade and base course variability.

A pool fund study has been established to conduct a national evaluation of the GeoGauge. These funds are being used to provide a GeoGauge to each participant, training to operate this device, consulting, and the GeoGauge Pool Fund Meeting conducted on November 29th and 30th, 2000 in McLean, Virginia.

FY 2001 - $12,500 FY 2002 - $12,500

Pooled Fund Study: ***Structural Improvement of Flexible Pavement Using GeoSynthetics for Base Course Reinforcement***

Host Agency - Maine Department of Transportation

High-modulus geogrids and geotextiles are being marketed as base course reinforcement to increase the structural capacity of flexible pavement sections constructed on weak subgrades. The AASHTO Task Force on Geogrid/Geotextile Specification is attempting to develop design standards for aggregate base course reinforcement; however, this effort is being hindered by the lack of field performance measurements for pavement sections designed for traffic loadings typical of state DOTs. This study will provide this missing data by constructing full-scale sections of pavement and underlying subgrade and then loading these pavements to failure using a Heavy Vehicle Simulator (HVS). Reinforced and unreinforced sections will be compared considering the effects of subgrade strength, aggregate base course thickness, pavement thickness, and frost action. A total of 32 sections will be tested with 8 sections tested per year. The study is estimated to cost $2,120,000. MDOT will contribute a total of $100,000 during the fiscal years 2002 through 2005.

FY 2002 - $25,000 FY 2003 - $25,000

FY 2004 - $25,000 FY 2005 - $25,000

Pooled Fund Study: ***NTPEP Pavement Markings Evaluation***

Host Agency – AASHTO (NTPEP)

Since its inception in 1994, the National Transportation Product Evaluation Program (NTPEP) has conducted 2-year field evaluation and laboratory testing on pavement marking materials. With the advent and use of performance-related and warranty specification for durable pavement markings, there is a mounting need to extend the NTPEP field evaluation. During their summer 2000 meeting, the NTPEP Oversight Committee and participating industry discussed extending the field evaluation from two to three years for durable materials. The one-time contribution to this pooled fund will facilitate implementation of the third year of evaluation for the 2001 northern Utah test deck, the 2002 Pennsylvania test deck and the 2002 Mississippi test deck.

FY 2002 - $5,000

Pooled Fund Study: ***Use of Field Permeability Test to Control HMA Density***

Host Agency – Alabama Department of Transportation (NCAT)

Pavements that are not properly compacted have a high potential for allowing water and air to penetrate into the pavement structure. Air penetrating into a pavement can oxidize the asphalt binder coating aggregate particles and lead to premature cracking. Water infiltrating a pavement can cause moisture damage through stripping of the asphalt film from the aggregate particles. For many years pavement in-place density has been specified to ensure that pavements are not permeable to water or air. Work by NCAT and others has indicated that different pavements become excessively permeable at different density levels. This suggests that density alone may not be sufficient in ensuring a durable pavement. Recent research by NCAT has shown the potential of using a field permeability device for identifying a HMA pavement that is excessively permeable. This study evaluates the use of a field permeability device to determine adequate densities of HMA mixes based on permeability considerations. The required densities based on permeability will then be compared to the required densities dictated by current density specifications. This is a one-year study.

FY 2002 - $20,000

Pooled Fund Study: ***Investigate Aggregate Shape Effects on HMA Performance Using Image Analysis Approach***

Host Agency – FHWA

Aggregate shape factors such as angularity and flat and elongated ratio as well as surface texture influence hot-mix asphalt (HMA) behavior and performance. The shape of aggregate particles has been related to permanent deformation, fatigue resistance, shear resistance, and skid resistance of the pavement. There are currently no standard test methods for directly and objectively measuring these coarse aggregate parameters. The qualitative indirect methods now used by the paving industry are quite tedious. The recently developed image analysis system, referred to as the University of Illinois Aggregate Image Analyzer (UI-AIA) will be used in this research to quantify shape, angularity, gradation, and surface texture of coarse aggregates from video imaging in a fast and automated way. In Phase I of the proposed research study, coarse aggregate samples will be received from the NCAT Pavement Test Track Facility in Auburn, Alabama. These samples will be taken from the materials used in the construction of that test track. Phase II of this study will focus on an evaluation of shape and size effects of coarse aggregate on hot mix performance. The study is estimated to cost $80,000 for Phase I. A decision to proceed with Phase II will be made at a subsequent date for an additional cost of $70,000. Two years will be required to complete both phases of this study at a total cost of $150,000. MDOT will contribute a total of $20,000 to this study assuming both phases are implemented.

FY 2002 - $10,000 FY 2003 - $10,000

Pooled Fund Study: ***Improve a FHWA Device to Test for Potential Soil Liquefaction Caused by Earthquakes***

Host Agency – FHWA

The New Madrid Fault, located 120 miles north of Memphis, Tennessee, is a seismic threat to north Mississippi. Soft to medium stiff clays are vulnerable to amplified ground motions and loose to medium-dense saturated sands are moderately to highly susceptible to liquefaction and large deformations. The objective to this study is to develop several necessary enhancements to an existing FHWA impulse shear test device. This device provides site-specific information from results of tests performed in-situ on soil deformation characteristics and liquefaction potential needed for seismic analysis procedures. The study is estimated to cost approximately $400,000 over a three-year period. MDOT will contribute a total of $30,000 during the fiscal years 2002 through 2004.

FY 2002 - $10,000 FY 2003 - $10,000 FY 2004 - $10,000

TECHNICAL AND EVALUATION PROJECT NO. TE-030
HIGH PERFORMANCE CONCRETE PAVEMENT
WORK ORDER NO. DTFH71-99-TE030-MS-12
(State Study No. 137)

TOTAL STUDY BUDGET: $90,242	TOTAL STUDY COST TO DATE: $58,003
DATE STARTED: 08/09/99	COMPLETION DATE: 09/30/06
STUDY TITLE:	Resin Modified Pavement Demonstration Project
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATORS:	John W. Avent and Randy L. Battey

Background:
Resin Modified Pavement (RMP) is a new composite paving material consisting of a thin layer (2 inches) of open graded hot mix asphalt (HMA) whose internal voids (approximately 30% voids) are filled with a latex rubber-modified portland cement grout. Some of the objectives that the RMP material was developed to address are:

- resist damage from rutting
- resist damage from fuel spillage
- easily to construct with conventional construction equipment
- require no joints
- have comparable life cycle costs with other rehabilitation methods.

Objective:
The objective of this project is to construct a demonstration RMP highway project and compare its performance with ultra-thin whitetopping (Portland cement concrete inlay) and polymer modified asphalt, for a period of five years. The proposed study will be constructed in an intersection with a HMA pavement with a history of rutting and a high traffic loading.

Progress:
Test sections involving the three subject pavements were constructed on US 72 in Corinth, Mississippi in the Spring of 2001. Pre and post construction data was collected on the condition of the sites. Documentation of construction and condition data has been compiled for inclusion into an interim (Construction) report that is currently being produced.

Plans for FY 2002:
Finalize and distribute the interim report to interested agencies. Continue monitoring and documenting the condition of the pavement sections.

Cost Estimate for FY 2002: $10,000

Mississippi
Department of Transportation

RESEARCH WORK PROGRAM
SPR-1(38), Part II
Q56

For the Fiscal Period
October 1, 2001 to September 30, 2002

Prepared by the
Mississippi Department of Transportation
RESEARCH DIVISION

In Cooperation with the
U.S. Department of Transportation
Federal Highway Administration

Mississippi
Department of Transportation

RESEARCH WORK PROGRAM
SPR-1(38), Part II
Q56

For the Fiscal Period
October 1, 2001 to September 30, 2002